Emissions Trading: What Makes It Work?

Julien Chevallier

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Abstract:

At the stage of international post-Kyoto negotiations, the adoption of ambitious public policies raises an increasing interest, as society has a whole is more concerned by the scale of damages and the potential irreversibilities linked to climate change. The introduction of a tradable permits market in Europe on January 1, 2005, in order to provide incentives to Member-States to take early abatement measures, may be seen as a decisive first step towards that direction. The creation of the EU ETS has indeed revealed the key role played by the European Union in the preservation of the global public good that constitutes the climate. Following a review of current climate policies, and of the negotiations under way at the international level, this article critically discusses the main advantages of introducing environmental regulation tools such as tradable permits markets.

Keywords: climate change policy; emissions trading; banking borrowing; initial allocation; safety valve.

[1] University of London, Imperial College of Science, Technology and Medicine, South Kensington Campus, London SW7 2AZ, UK Email address: *j.chevallier@imperial.ac.uk*

Review of current climate policies

The European Union Emissions Trading Scheme (EU ETS) has been created on January 1, 2005 to reduce by 8% CO_2 emissions in the European Union by 2012, relative to 1990 emissions levels. This aggregated emissions reduction target in the EU has been achieved following differentiated agreements, sharing efforts between Member States based on their potential of CO_2 emissions reduction. The introduction of a tradable permits market has been decided to help Member States in achieving their targets in the Kyoto Protocol. This international agreement entered into force on February 2005 following the ratification of Iceland, and which aims at reducing the emissions of six greenhouse gases (GHG), namely carbon dioxide, methane, nitrous oxide, ozone, water vapour and halocarbons, considered as the main cause of climate change.

Among the Members of Annex B, these agreements include CO_2 emissions reductions for 38 industrialized countries, with a global reduction of CO_2 emissions by 5,2%. These agreements have been fostered by the United Nations Framework Convention on Climate Change (UNFCCC) which recognizes three principles: the precautionary principle[2], the principle of common but differentiated responsibilities[3], and the principle of the right to development[4]. 174 countries have ratified the Protocol, with the notorious exception of the United States. The first commitment period of the Kyoto Protocol goes from January 1, 2008 to December 31, 2012.

This political will has been reaffirmed at the international level during the UN Conference that took place in Bali on December 2007, where a roadmap of negotiations that should lead to a post-Kyoto agreement has been adopted. The United States are expected to cooperate, given the initiatives of emissions reduction introduced at the regional level[5]. The next round of negotiations will take place in Copenhagen on December 2009. As the Clean

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[2] Scientific uncertainty concerning the precise impacts of climate change does not justify delaying immediate action.

[3] Each signatory country recognizes the impact of its GHG emissions on climate change. The most industrialized countries carry a heavier historical responsibility, given their prior GHG-intensive development, which translates into tighter targets.

[4] Action will be taken in accordance with the economic development of each country.

[5] We may cite the *Regional Greenhouse Gas Initiative* (RGGI), which contains several GHG reduction objectives in nine North-Eastern States, and the Assembly Bill 32 in California which aims at reducing CO_2 emissions by 25% by 2020 relative to 1990 emissions levels, and by 80% by 2050. At the federal level, while the Waxman-Markey *American Clean Energy and Security Act* is in the eye of the Senate, the *Climate Stewardship Act* introduced by the Senator Lieberman-McCain did not find sufficient political support to become legally binding. The Waxman-Markey bill passed by the Congress on June 27, 2009 may be a decisive step towards establishing a cap-and-trade scheme as of 2012, with has a has a goal of reducing greenhouse gases in the United States to 17% below 2005 levels by 2020, and 83% by 2050.

Development Mechanism (CDM)[6] has revealed the strong potential of CO_2 emissions abatement in countries such as Brazil, China or India, the main issue of these negotiations is linked to achieving the largest possible level of cooperation, in order to avoid the well-known free riders behaviours, and to preserve the global public good that constitutes the climate. On this matter, the European Union has clearly adopted a leadership position, which contrasts with its early reluctance during the first steps of the negotiation of the Kyoto Protocol.

On January 2008, the European Commission has extended the scope of its action against global warming by 2020 with the “energy and climate change” package. This package aims at reducing GHG emissions by 20%, at increasing the use of renewable energy in energy consumption to 20%, and at saving 20% of energy by increasing energy efficiency. The European carbon market, which has currently entered its Phase II (2008-2012), has been confirmed until 2020 also. Its scope has been extended to major sectors in terms of CO_2 emissions growth, such as aviation and petro-chemical industries during 2013-2020. These repeated public policies in favour of climate protection aim at correcting the negative externality attached to the release of uncontrolled GHG emissions in the atmosphere and thus, according to the well-known principle in economics, at internalizing the social cost of carbon. At the same time, these initiatives reveal the difficulty to create a scarcity condition regarding CO_2 emissions. These emissions indeed were not limited in the pre-existing institutional environment, and thus could not be considered as a scarce resource.

Below, a discussion on how a tradable permit differs from other environmental regulation tools is presented, and key design issues that make emissions trading work are highlighted.

How is a tradable permit different?

To answer this question, it appears useful to debate first about the notions of “right to pollute” and of “marketability of the environment”. One may recall for instance the controversy initiated by the introduction of tradable permits markets in the United States, and summarized by Sandel (1997).

Since the aim of the Kyoto Protocol is to limit the global level of GHG, one might ask, what difference does it make which places on the planet send less GHGs to the sky? It may

[6] According to the article 12 of the Kyoto Protocol, CDM projects consist in achieving GHG emissions reduction in non-Annex B countries. After validation, the UNFCCC delivers credits that may be used by Annex B countries for use towards their compliance position.

make no difference from the standpoint of the heavens, but it does make a political difference. Turning pollution into a commodity to be bought and sold removes the moral stigma that is properly associated with it, if a company or a country is fined for spewing excessive pollutants into the air, the community conveys its judgment that the polluter has done something wrong. A fee, on the other hand, makes pollution just another cost of doing business, like wages, benefits and rents.

One may object to these remarks that it is not immoral to reduce acid rain by half through tradable permit system among electrical utilities in the United States, reducing sulphur dioxide faster than anyone had predicted, and saving up to U.S.$ 1 billion a year for electricity consumers (see Ellerman et al. (2000)). Besides, virtually any manufacturing activity entails the creation of some pollution. So the question is not will we pollute, but rather how much. Further, if there is to be pollution, the regulator shall try to provide economic incentives in order to fight against negative consequences on the environment. Such a trade-off is facilitated by tradable rights.

Thus, maintaining a moral stigma on pollution makes sense for hazardous substances where polluters have choices, for reducing the pollution. But global warming is not such a situation. Indeed, do we need to feel ashamed when we cook dinner, switch on a light, or turn on a computer to write an article? These daily habits may not be associated with immoral behaviours. However, the current level of consumption per capita, on several locations on the planet, does not seem compatible with the observed global warming. Thus, the debate on the introduction of tradable permits markets avoids discussing the fact that the state of the planet can no longer afford consumption lifestyles with cheap energy prices.

Let us now discuss about the increasing influence of the market as a regulation tool of environmental externalities. With the extension of the scope of human activity, one can notice a trend of increasing demand for environmental goods. High-income societies tend to value environmental goods more, according to the environmental Kuznets curve[7]. Therefore, how do we manage the scarcity of environmental goods? Simultaneously, a trend of increased reliance on markets may be underlined, as in Europe many fields have been deregulated (telecoms, electricity, etc.). Let us further distinguish between organized markets, where the government mainly enforces regulation[8], and constructed markets that appear in the

[7] Note that the empirical validation of this relationship is subject to numerous discussions, that we do not report here.
[8] Antitrust activities for instance.

environmental field where there is a need to set up an institution[9]. The latter case involves a redefinition of the government role which consists in creating the market for individual needs, and then not coming back to regulate.

The circumstances that are favourable to the adoption of tradable permits include a large number of agents to regulate, an asymmetrical and strategic access to information, a high level of heterogeneity of costs and opportunities across decentralised agents, and uncertainty about the shape of cost and damage curves[10]. In a cap and trade system, agents are allowed to exchange permits with a quantity limit, without regulatory approval, where the regulator compliance requirement is to monitor emissions and surrender permits. The "rights to emit" are created as permits endow the installation. Firms need to meet the terms of that implicit contract: permits become an input to production, and are traded as such. The abatement decision is shifted to firms, since they have more information of what can be done than the regulator. Thus, the regulator only needs to enforce the emissions cap.

Does emissions trading have effects that would tamper enthusiasm for this instrument? The U.S. Acid Rain Program provided empirical support to the view that market-based instruments may be more environmentally efficient than command and control regulation. SO_2 emissions fell, and the program was characterized by a quick implementation, a positive role of banking (twice as much as required), a good compliance and no hot spots. These optimistic results may be limited to flow pollutants, since for stock pollutants like CO_2 the incentive to abate is less temporally and spatially constraining. Finally, Babiker et al. (2004) underline that all countries do not benefit equally from the introduction of an international system of exchangeable quotas, given the pre-existing institutional environment and the terms-of-trade effects.

Following the discussion of the main differences of tradable permits markets with regard to other environmental regulation tools, we detail next the choices that need to be made by the regulator during the creation of the tradable permits market to ensure its cost-efficiency and environmental integrity, especially concerning the spatial and temporal limits, the initial allocation, as well as the introduction of a safety valve.

Market design issues

[9] In order to provide clean air or water for instance.
[10] On this point, see the seminal article by Weitzman (1974).

Spatial and temporal limits

Concerning spatial limits, it is worth emphasizing scaling issues. Increasing the scale of the cap and trade system increases economic efficiency, but also decreases trade security. The regulator also needs to take into account deposition constraints, by avoiding excedance of critical loads in specific geographical zones[11]. Another concern lies in the proper design of national emission ceilings.

Concerning temporal limits, banking and borrowing may be used to equalize marginal costs in present value. It forms another dimension of efficiency by adding the time dimension to cost savings. The authorization of these provisions appears desirable on a tradable permit market, since they allow firms to achieve their depolluting objective at least cost by smoothing their emissions overtime. However, they may also change the temporal profile as well as the magnitude of environmental damages. From the regulator's viewpoint, the best configuration of the intertemporal flexibility mechanism therefore consists in authorizing banking without restrictions, and in penalizing borrowing by using a non-unitary intertemporal exchange ratio (Rubin (1996), Kling & Rubin (1997)).

Initial allocation

According to Raymond (1996), initial allocation reveals social norms, and what society considers as acceptable on how to distribute the newly created permits.

Different allocation methodologies may be chosen, such as methodologies based on grandfathering (free distribution in proportion of recent emissions or a benchmark), auctioning, baseline emissions, or per capita allocation. It is not obvious to tell how tradable permits should be allocated. Even if theory suggests that auctioning is the best methodology (Ekins & Barker (2001), Jouvet et al. (2005)), it rises equity-based objections. The definition of what is "fair" is problematic, and a “compromise”[12] must be found between local and global interests, which in return bring us to what appears “acceptable”, for instance concerning climate policies at the international level.

Newell et al. (2005) emphasize that tradable permits create rents, and grandfathering distributes those rents to existing firms while also erecting barriers to entry. To counter-balance these negative effects, let us note that the direct allocation of grandfathered permits offers a degree of political control over the distributional effects of regulation, enabling the

[11] This comment obviously depends on the nature of the pollutant.
[12] This notion is developed by Boltanski et Thevenot (1991).

formation of majority coalitions. Once the permits market has been introduced, then the regulator may strengthen the environmental constraint.

Finally, the regulator may choose emission targets in absolute value (a fixed amount of permits known in advance), or in relative value (with respect to production or to a technological standard for instance) (Ellerman & Wing (2003)).

It appears useful to distinguish between the *effectiveness* of a tradable permit market, *i.e.* how much emission reduction it will achieve, from its *economic performance*, *i.e.* what allocation effects are to be expected.

The main interest of auctioning permits consists in the *income transfer*, which may take the form of a lump-sum or a tax rebate, and reduces pre-existing distortions. This recycling revenue effect, also called *double dividend*, takes place when auctioning permits allows decreasing taxes and reducing distortions. This should have a positive effect on supply of capital and labour, but the net effect on high- or low-income quintiles depends on the tax structure. If the tax cut benefits more to richer people, then there is a clear trade-off between efficiency and equity (Dinan & Rogers (2002)).

Safety valve

A safety valve is a hybrid instrument to limit the cost of capping emissions at some target level, whereby the regulator offers to sell permits in whatever quantity at a pre-determined price. If prices are greater than expected, the marginal cost of abatement would be limited to the safety valve price. The regulator tries to set the emissions cap at a level where the expected marginal cost of meeting the constraint will match the beliefs about marginal benefits. Another advantage consists in keeping the attractiveness of a quantity target, and the use of a price mechanism in order to regulate the emissions of pollutants. The main criticism of a safety valve consists in the determination of a "fair" price by the regulator: if the safety valve price is too high, it will have no effect. Conversely, if the safety valve is too low, the quantity constraint is not binding anymore, and may be associated with a permanent tax. Moreover, there is a potential loss of "environmental integrity", *i.e.* a fear of relaxing towards target reduction instead of supporting economically efficient implementation. The regulator shall thus attempt to avoid excessive violations of the original target. Finally, it is worth asking whether it appears useful to dilute the quantity constraint.

The RECLAIM program in California regulating SO_2 and NOX emissions constitutes a good example of a system that would have required a safety valve. According to Harrison

(2003), this multi-source program had overlapping control cycles and trading between control groups, so *de facto* six-month banking and borrowing. But the temporal flexibility was not enough for such a limited geographic scope and, as unusual weather conditions and lack of new capacities placed high demand on existing units, the permit price rose from $5,000 to $90,000 per ton, *i.e.* multiplied by 18. The disconnection of electricity and environmental markets, associated with other program design failures[13], led the State to eventually took over and provide adequate electricity supply. At the same time, prices of future vintages (borrowing) revealed the short-term nature of the crisis and recognized that it was an unusual case.

Jacoby & Ellerman (2004) recall that the discussions on the adoption of a safety valve emerged in the United States concerning the costs involved by the Kyoto Protocol. It was discussed as a way of raising the likelihood of the ratification of the Protocol, by blunting the criticism that the cost of meeting the Kyoto targets would be too high.

However, it does not always appear profitable to limit price variations on tradable permit markets. Allowances are indeed distributed freely, and form another asset compensating the cost of the constraint on CO_2 emissions, which tend to stabilize the net financial position of firms. Moreover, financial instruments are being developed in order to hedge against the risk of temporary price variations, for instance on the EU ETS. Thus, in order to obtain stable and predictable prices, Member States shall simply levy a tax, which does not appear politically feasible at the international level.

Concluding Remarks

This article reviewed the wide array of choices that must be made by the regulator during the creation of tradable permit markets, such as the EU ETS and the Kyoto Protocol. We highlighted numerous debates at stake concerning the spatial and temporal limits, the allocation methodology, and the introduction of a safety valve. As a final comment, it should be emphasized that emissions trading involves a steep learning curve for regulatory bodies and market participants alike, which brings institutional learning effects and further amendments to the development of the trading systems currently operating.

[13] Such as the lack of pre-specified civil and criminal penalty, risk of facilities shutting down and people buying small but highly polluting generators, etc.

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